

300 Area End State Workshop, May 19, 2005

Groundwater Remediation

Questions:

Groundwater Remediation Alternatives and Technologies

- Are the alternatives we are considering for the groundwater feasibility study appropriate?
- Are you aware of any other potential groundwater technologies which should be considered?
- Are there other considerations that should be evaluated?

Groundwater Remedy Selection Considerations

- Given the possible types of surface uses and the potential groundwater remediation alternatives, what considerations are important for groundwater remedy selection? (For example, what is an acceptable period of time to achieve groundwater goals, and under what surface end states would it make sense to continue with monitored natural attenuation or be necessary to pursue alternative approaches?)

Group 1 – Facilitator - Shelley Cimon

Groundwater Remediation Alternatives and Technologies

- Install a grout curtain up gradient of the uranium plume. Allow river/groundwater interaction to clean out the uranium in groundwater
- Look at other sites with uranium contamination (for example Fernald) – what remedy did they choose and is it applicable (someone who had worked on the groundwater cleanup at Fernald was at the meeting and gave a brief description of the groundwater remediation approach used)
- In situ vitrification
- Don't allow development to preclude remedies that might be applied in the future.
- Alter the chemistry of the groundwater (by modifying the pH or redox potential) moving into the 300 Area so that uranium stays immobile.

Groundwater Remedy Selection Considerations

- Uranium has a very long half life.
- Need to determine the effects of uranium on aquatic organisms
- Can we protect aquatic organisms by denying them access to uranium at the shoreline (with riprap or other access barrier)?
- Need to look at the total load of contaminants in the river effecting aquatic organisms – not just the 300 Area contributions
- Need to think long term – the land use will change with time.
- Natural attenuation did not reduce uranium concentrations to the drinking water standard in 10 years. Some questions need to be answered about this approach.
 - How long will it take?
 - So how long do institutional controls need to work to protect people from using water that is above the standard?
 - How long can we wait?

Group 2 – Facilitator - Gariann Gelston

- Pump and treat is not successful at reducing the concentration of uranium in the groundwater, but we may be able to use it to keep the plume from reaching the river (i.e., hydraulic control), although it would be difficult.
- May be able to stop uranium transfer from the vadose zone to the groundwater.
- Can't destroy uranium, but can change its form and stabilize it.
- Need to understand source of uranium to understand groundwater treatment options. Multiple release sites (e.g., 321 building tank), all commingled.
- Net loss of groundwater to the river is low.
- Need a phased approach. First characterize; then identify remedial approach.
- Influence of facility and piping D&D on vadose zone and groundwater contamination is unknown.
- Is technology really the problem, or is it implementation?
- Maybe we just need to clean up the deep vadose zone contamination.
- Could use "bugs" (i.e., bioremediation) to aggregate uranium into clumps, and then use in situ vitrification to immobilize the clumps.
- Characterization of groundwater contamination can be done in parallel with facility D&D. Sometimes old records are missing, so we need to verify assumptions about contamination as D&D progresses.
- Excavation results in worker exposures and transportation of large volumes of soil to ERDF.
- There is a schedule issue between D&D activities and the groundwater RI/FS process.
- Can't do a cost estimate to show the difference between industrial and residential cleanup levels until we characterize where the areas of contamination are. Use a relevant time frame and don't over-inflate the costs.
- Where D&D stops depends on the definition of "clean". The D&D Program hands off the cleanup responsibility to the Remedial Action Program for the soil 15 feet below the structures.
- Groundwater focus now includes the deep vadose zone.
- There are conflicting opinions on what sources are contaminating the groundwater.
- It is scary for workers being pushed to exceed the baseline schedule.
- Cost estimates must use life-cycle costs and include institutional controls and surveillance and maintenance costs.
- Don't rely on old data. Take baby steps to keep the workers safe.
- Consider relative risks of technologies to workers and the public.
- Understand contingency management in cost estimates.
- Hauling contaminated soil to ERDF doesn't resolve the uranium concentration issue.
- Stabilization of uranium isn't seriously considered.
- Need to look at uranium treatment technologies (e.g., vitrification).
- We could develop a decision tree showing which technologies impact the effectiveness of other technologies.
- Cryogenics (freeze wall)
- Schedule should be driven by what technology will allow and not by the arbitrary 2012 cleanup milestone for the River Corridor. Throw out accelerated cleanup.
- Use a golf course as part of the remedy to drive uranium out of the groundwater and treat it.
- "Bugs" are already in the aquifer, but the conditions aren't right (e.g., nutrients). Is there a fear factor about bioremediation (i.e., injecting something into the aquifer)?
- We need a better understanding of the limitations of the technologies.
- Be careful about altering the waste form. We could create more problems.
- Water conservation technology could be used with the golf course to manage water use.
- Could build a water park to flush the uranium out of the vadose zone.
- K_d values are variable.

- Buildings should act as a barrier to keep water out of the vadose zone, but underground pipes and sewer lines leak water into the ground, especially the old 300-Area infrastructure.
- Uranium is not just under the building footprints.
- The “no action” alternative should be considered.
- Scientists are currently studying how uranium chemistry changes over time to improve groundwater models.
- Research documents should be provided to a broader audience.
- The groundwater flow pattern in the 300 Area is complex (South and East).
- It is very likely that monitored natural attenuation could work in the foreseeable future.
- Dams have a 50-year design life and won’t exist forever.

Group 3 – Facilitator – Susan Leckband

- Combination of alternatives (new alternative) e.g., hydraulic containment (tunnel) and flushing to capture
- Barrier, pump and treat then capture
- Vadose Zone has a longer list of contaminants; want area below 15’ and groundwater frozen e.g., in situ, fix in place
- Keep digging. Do not stop at 15’. Dig until you hit groundwater (35’). Dig until groundwater is not hitting contaminated soil.
- Consideration: health of the hyporeic zone (bugs ecosystem). Consider the impact to this zone. This zone has high tribal importance.
- Would not a significant pump and treat system capture most of the contaminants? Could do areas at a time.
- Tried unsuccessful sheet metal barrier; what about a freeze barrier to freeze the aquifer?
- Length of technology usage – how long are we willing to wait to use the land
- Uranium flushing (big flush) – would consider. Want an accountable agency in place. Would be willing to get to source term sooner. (Ecology did not believe a major problem; could not do without institutional controls)
- Stabilize forever by 2018; no risk to the public
- What proportion of the uranium comes from 300 Area vs. total natural uranium sources?
- Consider cesium, strontium and other contaminants in the 300 Area. Stabilize forever or cleanup. Are there contaminants with levels of concern? Many are close to the surface and could be removed.
- Consider mobility of contaminants in the feasibility study.
- Are there specific list/combination of possible technologies? Need to address groundwater and soils as an integrated system.
- Children and pregnant women are the most susceptible. Institutional controls need to address this sensitive population.
- Cleanup standards need to address tribal consumption standards.
- Do waste sites outside of the 300 Area contribute to groundwater contamination? Yes, tritium. It will be dug up.
- After the majority of sources are cleaned up and if monitored natural attenuation data show decrease to acceptable levels, cleanup could take longer.
- Concentration and pathways are the two major factors of consideration. If data show reduced harm, what is the hurry to clean it up. The only real driver would be desire for the land.
- Consider the cumulative/synergistic effects of all contaminants.
- Remedy/institutional control failure – need to go back and revisit the remedy.
- If there is a change in the planned land use, need to look at something other than monitored natural attenuation.

- Cost is very large to get from one land use to another.
- Where is the future land use decision made – interim or final RODs?